Claims

1. A method for the wet mechanical processing of a mixture of materials, in particular all kinds of waste, consisting of inert materials, water as well as organic materials having a water-soluble and a bioconvertible part, wherein water is used as solvent, detergent and separating agent,
characterized in that

the mixture of materials is at first continuously mixed in a mixer (4) with water as separating agent and detergent, without separating off compounds of the mixture, until a dry substance content of 15% to 25% is adjusted,
that in a first step

the mixture of materials is discharged from the mixer (4) by means of a conveyor (9), wherein by the addition of water (11, 12) the light components remain dissolved in a solid/liquid mixture having a dry substance content of 10% to 20%, whereas the heavy components settle and are separated by means of the conveyor as first inert heavy fraction (15) having a grain size of > 25 mm,

from the remaining solid/liquid mixture (14), organic light materials having a grain size of 30 to 120 mm are sieved off, reached and pressed as first organic light fraction (22),
that in a second step

from the remaining suspension having an adjusted dry substance content of 6% to 12% are separated out at first inert heavy materials (28) having a grain size of 2-25 mm by gravity and subsequently further organic light materials (32) having a grain size of 3 to 30 mm by sieving and rinsing,

that in a third step

from the remaining suspension having an adjusted dry substance content of 3% to 8%, further inert heavy materials (40) having a grain size of < 2 mm are separated out by centrifugal forces and subsequently further organic light materials (49) having a grain size of 150 µm to 3 mm by sieving and rinsing.

2. The method according to claim 1, characterized in that in the first to third step, fresh water or recirculated water consisting of unprocessed and/or purified filtrate or respectively sewage water of the second and/or third step is used as solvent, detergent or respectively separating agent.

3. The method according to the claims 1 and 2, characterized in that in the pre-step of the mixing, the mixture of materials is conveyed into the mixer (4) by means of a dosing conveyor (2) and that already in the conveyor (2) water, preferably recirculated water, is added for improving the wetting ability of the mixture of materials and for pre-mixing.

4. The method according to one of the claims 1 to 3, characterized in that in the first step the discharge (8) from the mixer (4) is separated by means of a spiral conveyor (9) that disposes of sufficient free section area in the upper part, so that a part, principally consisting of light materials, is directly carried away into an upflow classifier (10) above the screw and that another part, principally consisting of heavy materials is

further cleaned of light materials by means of rinsing water (13) and is discharged via the spiral conveyor (9).

5. The method according to claim 4, characterized in that in the first step the light materials (14) are transferred outward into the sieving (16) via the hydraulic pressure caused by the filling level in the mixer (4), the pre-pressure via the rinsing water pumps (54, 55) as well as the fresh water supply (13) via the upflow classifier (10).

6. The method according to claim 4, characterized in that in the first step the heavy materials in the conveyor (9) are rinsed with filtrate of the second step (11) and purified filtrate of the third step (12) as well as with fresh water (13) in a cascaded manner, wherein the settling heavy materials are cleaned of the dissolved organic material, the light materials and the finer heavy materials.

7. The method according to claim 6, characterized in that in the first step, compressed air is additionally employed for rinsing the heavy materials in the conveyor (9).

8. The method according to the claims 6 and 7, characterized in that the inert heavy materials (15) that have been discharged in the first step are dumped directly or after a post-rotting or respectively deterioration.

9. The method according to the claims 6 and 7, characterized in that the inert heavy materials (15) that have been discharged in the first step are crushed via a breaker and after the crushing are either added to the mixture of materials of the second step, in the case of a crushing to less than 15 mm or the mixture of materials of the third step, in the case of a crushing to less than 3 mm for further purification, wherein before the crushing, metals are separated out by a metal separator.

10. The method according to claim 5, characterized in that in the first step, the light materials (14) are rinsed with purified filtrate of the third step (18) and/or with fresh water during the sieving (16).

11. The method according to claim 10, characterized in that in the first step the sieved light materials (22.1) are dehydrated by a single-step or multiple-step mechanical dehydration.

12. The method according to claim 11, characterized in that the light materials (22.1) are crushed before being pressed off (19), so that among others a higher dehydration rate of biogenous organic compounds can be achieved.

13. The method according to one of the claims 1 to 12, characterized in that the filtrates (17, 21) of the first step are

conveyed into a sedimentation basin (23) of the second step due to the hydraulic pressure.

14. The method according to claim 13, characterized in that in the second step, the filtrates (17, 21) of the first step are rinsed in a conveyor (24) with air and/or with filtrate from the third step (25) and/or with fresh water (26) in a cascaded manner, wherein further heavy materials (28) are cleaned of the dissolved organic, the light materials as well as the finer adhering heavy materials.

15. The method according to claim 14, characterized in that the light materials (27) that are carried away from the sedimentation basin (23) via an overflow reach a sieve (29) where they are sieved, rinsed and pressed off.

16. The method according to claim 15, characterized in that the light materials (27) that have been separated out via the sieve (29) are dehydrated by a single-step or multiple-step mechanical dehydration.

17. The method according to one of the claims 1 to 16, characterized in that the filtrate (33) of the second step at first is conveyed into a filtrate vessel and therefrom is conveyed into a hydrocyclone (36) in the third step, by means of which, according to the dry substance content and viscosity of the filtrate, heavy

materials of a grain size up to 50 - 150 µm are being separated out.

18. The method according to claim 17, characterized in that the underflow (37.2) of the hydrocyclone is classified and washed by a sorting spiral (38) by addition of recirculated water (58), wherein the purified heavy fraction is washed and dehydrated via a sedimentation basin having a screw discharge (39) by rinsing with fresh water (37.3) as well as the heavy fraction that is loaded with organic material and the washing water (41) is recirculated into the filtrate vessel (34) of the second step.

19. The method according to claim 17, characterized in that the underflow (37.2) of the hydrocyclone is washed and dehydrated via a vibration sieve with fresh water rinsing.

20. The method according to claim 17, characterized in that the overflow (37.1) of the hydrocyclone is conveyed to a vibration sieve (43), the sieved-off particles are rinsed with fresh water and/or filtrate, the pre-thickened filter cake (44) is dehydrated mechanically via a screw presses (45) and the press water is recirculated into the vibration sieve (43).

21. The method according to claim 20, characterized in that the filtrate (50) from the vibration sieve (43) is completely or partially processed in an aerobic manner or in an anaerobic manner and subsequently recirculated into the process.

22. The method according to claim 21, characterized in that the filtrate (50) is conveyed into a further filtrate vessel (52), wherein the residence time of the filtrate (50) in this vessel as well as the residence time of the filtrate (33) of the second step in the filtrate vessel (34) that is connected upstream of the hydrocyclone by a respective dimensioning of the vessels is selected such that a hydrolysis of the filtrates is effected.

23. The method according to claim 22, characterized in that a partial stream of the filtrate (53) from the filtrate vessel (52) is purified via an anaerobic sewage treatment and the purified discharge from the sewage treatment is re-used as recirculated water in the process, wherein by a low pH of the recirculated water, a higher solubility of the organic fraction can be achieved.

24. The method according to one of the claims 21 to 23, characterized in that the filtrate of the third step that has been processed in an aerobic or anaerobic manner is cleaned of pollutants and/or of salts before being recirculated into the process as recirculated water via microfiltration, nanofiltration or reverse osmosis systems, wherein via the purified recirculated water, the pollutant concentration of the mixture of materials in the process is reduced.

25. The method according to one of the claims 21 to 24, characterized in that the recirculated water (57) is heated up to 30-85° before recirculation into the process via a heat exchanger

(56) for improving the separating performance of the total system, dehydration rate of the organic fraction, the solubility of the fermentable organic material and the sterilization of the individual fractions as well as for adjustment of the temperature of 35° or 55° that is required for the fermentation of sewage water (53) and/or of the light material fractions (22, 32, 49).

26. The method according to one of the claims 21 to 25, characterized in that for the fermentation of the sewage water (53) as well as of all or individual light material fractions (22, 32, 49), a method known in the prior art, in particular the dry fermentation process or also the wet fermentation process is employed.

27. The method according to claim 26, characterized in that the light material fractions (22, 32, 49) that have been separated out in the first to the third step during the fermentation are adjusted to a predetermined dehydration rate and that a post-crushing is performed upon them.

28. The method according to one of the claims 1 to 27, characterized in that the light material fractions (22, 32, 49) that have been separated out in the first to the third step are conveyed into a hydrolysis or a percolation, wherein the light materials after the hydrolysis or the percolation have better mechanical dehydration properties.

29. The method according to one of the claims 1 to 28, characterized in that the light materials (22, 32, 49) that have been separated out during the first to the third step are dehydrated principally mechanically and/or are thermally or thermally-biologically after-treated and dried for the energy utilization or utilization as material in the form of a dry fertilizer.

30. The method according to claim 29, characterized in that the thermally dried light material fractions (22, 32, 49) are used as dry fertilizer pellets after a pelletization for the improvement of the plant tolerance.

31. The method according to claim 29, characterized in that the dried light fractions (22, 32, 49) are employed as pelletization auxiliary means for the pelletization of substitute combustibles as packaging waste or reprocessed sieve overflow from mechanical-biological processing plants, whereby at the same time, the thermal stability of the combustible pellets in the use in shaft gasification methods is improved.

32. The method according to one of the claims 1 to 31, characterized in that the sludge from the aerobic and anaerobic recirculated water processing is utilized due to a remaining pollution load separately from the purified light material fractions (22, 32, 49).

33. The method according to one of the claims 1 to 32, characterized in that the very fine heavy materials that remain in the filtrate after the third step and remaining very fine material are separated along with the sludge from the purification of the recirculated water.

34. The method according to one of the claims 1 to 33, characterized in that the controlling of the quantities of the circulation, fresh and sewage waters is effected dependently on the viscosity of the recirculated water and the current consumption of the mixer (4).

35. A device for performing the method according to one of the aforementioned claims, consisting of the serial mounting of

a dosing conveyor (2), a mixer (4), a spiral conveyor (9), an upflow classifier (10), a sieving device (16) and a press (19)

in a first step of the method

a sedimentation basin (23), a screw discharge (24), a sieving device (29) and a filtrate vessel (34);

in a second step of the method

a rotary pump (35), a hydrocyclone (36), a vibration sieve (43) and a screw press (45), as well as, upstream of the hydrocyclone, a sorting spiral (38), a calming bath with sand discharge (39); and

in a third step of the method

36. The device according to claim 35, characterized in that the dosing conveyor (2) of the first step of the method is a spiral conveyor.

37. The device according to claim 35, characterized in that the mixer (4) of the first step of the method is designed as a standing vessel having a stirrer (7) that is preferably driven from below, wherein the discharge of the suspension is provided in the lower area of the mixer.

38. The device according to claim 35, characterized in that the spiral conveyor (9) of the first step of the method has a maximum diameter of 300 mm and a thread pitch of about 150 mm as well as in the upper area a free section of about 150 mm.

39. The device according to claim 35, characterized in that the sieving device (16) of the first step of the method is a sieving screw that beside the function of sieving and washing also leads to a pressing of the light materials (22.1).

40. Device according to claim 35, characterized in that the press (19) of the first step of the method consists of one or more screw presses.

41. Device according to claim 35, characterized in that the sedimentation basin (23) of the second step has the structure of a sand classifier.